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HYDRAULIC MECHANIZATION AT FISH INDUSTRY ENTERPRISES

B. N. Miller

The hydraulic elevation pump was first proposed by Engineer N. F. Chernigin in 1936. At present [1946], the NCh-3 model is used.

An 8-inch rubber suction hose is joined to the cast-iron mixing chamber. A conical nozzle leads into the mixing chamber from a centrifugal pump which forces water, or brine, through the chamber at very high speed, thus creating a vacuum in the chamber. The fish and the water are drawn from the hold of the boat or seine through a suction hose into the mixing chamber. This mixture passes from the chamber through a connecting pipe and into a diffuser where its velocity is reduced, and then into a water separator. The fish are lifted from the water and the water drains back into the boat. Since this pump can only raise the fish 2.5 meters, a means of raising the ejected fish high is necessary.

In 1938, an American 10-inch centrifugal pump, manufactured by Fairbanks-Morse, was used for unloading fish. In 1939, a domestic 4-inch centrifugal pump of the NF type was used. The first experiments did not bring satisfactory results and only after numerous tests and adjustments in design did the centrifugal pump become practical as a means for unloading fish. Both types of centrifugal pumps had impellers with two vanes.

A successful stationary 4-inch centrifugal fish-pump installation was constructed at the Yenikal Fish-Processing Plant of the Crimean Fish Industry Trust. This pump, of the 4-NF type, was used for unloading khamsa. The 4-inch delivery pipe brought the fish up 4 meters into a tank from which they were delivered for processing by a hydraulic conveyor. The hold of the boat which had brought the fish was first filled by a separate 5-inch pump. The fish pump had an electric motor having a capacity of about 10 kilowatts, developing 970 revolutions per minute. The ratio of fish to water was 1:2; the output was approximately 50 tons of fish per hour; the loss of fish was 1 - 2 percent.

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In addition to stationary installations, a portable centrifugal pump for transferring fish from small boats to their mother-ship has been successful.

The 4-NF pump has been used for unloading kumasa from small boats, and the Fairbanks-Morse 10-inch pump for unloading Murmansk herring, young cod and pertuy [?] from bag-type nets. However, in the latter case, the large-diameter pump was used not because of the size of fish, but because of the lack of a smaller pump. The boat motor provided the drive for the pump. For reducing velocity at the end of the delivery pipe, a diffuser was installed from which the mixture of fish and water flowed into a water-separating trough on which the fish slid into the hold of the boat and the water drained into the sea. A hand-operated plunger pump was used for filling the centrifugal pump with water.

A second type of portable centrifugal pump is one mounted on a tractor. The 8-NF pump mounted on the "Stalinets" tractor is used.

A similar installation is used at one of the Dagestan fish processing plants for removing Caspian herring from casting nets. The pump is driven by the tractor engine turning over at 610 revolutions per minute. The ratio of fish to water is 1:4; the output of the unit is about 75 tons of fish per hour when operating at a capacity of 23 kilowatts. A suction hose, about 15 meters long, is used for drawing fish from the seine and delivering them into the pipe line by which they are conveyed to the processing point.

The Design Section of the Giproby (Institute for Planning Industrial Enterprises of the Fish and Sea Mammals Industry and Economy), under the direction of the author, designed three types of centrifugal pumps for unloading fish, the NR-100, NR-150, and NR-200.

	<u>NR-100</u>	<u>NR-150</u>	<u>NR-200</u>
Diameter of nozzle, millimeters	100	150	200
Revolutions per minute	901	770	580
Capacity, cubic meters per hour	110.0	300.0	550.0
Maximum pressure head, meters	9.0	14.0	14.5
Power, kilowatts	4.5	16.7	32.5

At present [1946], these fish pumps are being manufactured at one of the Soviet machinery plants.

The KVN type water-ring (vodokol'tsevoy) vacuum pumps are being manufactured at the "Krasnyy fakel" Plant.

	<u>KVN-4</u>	<u>KVN-8</u>
Discharge of air, liters per minute	400	800
Vacuum, meters	8.5	8.5
Revolutions of motor per minute	1,430	1,430
Maximum horsepower of motor	1.8	2.9
Weight of motor, kilograms	38.0	43.0

The use of vacuum pumps eliminates the necessity for delivery valves, which simplifies operation and eliminates loss of fish.

For transporting fish by hydraulic mechanization, an open hydraulic conveying trough is used, which is similar to that used by the sugar industry.

The trough used at the Yenikal Fish Plant has a right-angled cross section of 40 x 60 centimeters. It is made from boards, whose joints are calked and tarred. The straight part of the trough has a 5-percent slope and the curved part has a 7-percent slope. It is set on trestles at the required height above the ground. The output of such a trough is about 300 cubic meters per hour.

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One successful arrangement employed an 8 HP pump operating from a tractor. By the use of T-joints and elbows, a pipe system was worked out which permitted suction hoses to be attached at several different points, depending on the location of the nets from which the fish were to be pumped. This pump fed into a 120-meter pipe, accomplishing a 10-meter lift. The fish passed into a hydraulic trough at the end of the pipe, and 90 percent of the fish were alive upon reaching the tank at the end of the trough.

The labor saving effected by the use of pumps for unloading fish from boat holds is evident from the following figures.:

<u>Type of Handling</u>	<u>Tons Per Hour</u>
One worker, by hand	1.73
One worker, with elevator	4.00
Fish pump	11.25

In unloading from nets, the use of a pump is 17 times as productive per worker as hand methods.

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